Class Prep 2: 1.3.2 to 2.1.2

library(cmna)

# Chapter 1: Introduction to Numerical Analysis

## Section 1.3.2: Evaluating Polynomials

naivepoly <- function(x, coefs) {  
 y <- rep(0, length(x))  
   
 for(i in 1:length(coefs)) {  
 y <- y + coefs[i]\*(x^(i-1))  
 }  
   
 return(y)  
 }  
  
  
 betterpoly <- function(x, coefs) {  
 y <- rep(0, length(x))  
 cached.x <- 1  
   
 for(i in 1:length(coefs)) {  
 y <- y + coefs[i] \* cached.x  
 cached.x <- cached.x \* x  
 }  
   
   
 return(y)  
 }  
   
   
 horner <- function(x, coefs) {  
 y <- rep(0, length(x))  
   
 for(i in length(coefs):1) {  
 y <- coefs[i] + x \* y  
 }  
   
 return(y)  
 }

f <- c(30, -19, -15, 3, 1)  
 x <- c(-1, 0, 1)  
   
 naivepoly(x, f)

## [1] 32 30 0

betterpoly(x, f)

## [1] 32 30 0

horner(x, f)

## [1] 32 30 0

## Section 1.3.3: The nth Root Algorithm

nthroot <- function(a, n, tol = 1 / 1000 ) {  
 x <- 1  
 deltax <- tol \* 10  
  
 while(abs(deltax) > tol) {  
 deltax <- (1/n) \* (a / (x ^ (n - 1)) - x)  
 x <- x + deltax  
 }   
   
 return(x)  
}  
  
nthroot(100, 2)

## [1] 10

nthroot(65536, 4)

## [1] 16

nthroot(1000, 3)

## [1] 10

nthroot(pi, 2)

## [1] 1.772454

100^.5

## [1] 10

65536^(1/4)

## [1] 16

1000^(1/3)

## [1] 10

pi^.5

## [1] 1.772454

# Chapter 2: Error Analysis

## Section 2.2.1: Binary Numbers

as.integer(2^31 - 2)

## [1] 2147483646

as.integer(2^31 - 1)

## [1] 2147483647

as.integer(2^31)

## Warning: NAs introduced by coercion to integer range

## [1] NA

-2147483646L

## [1] -2147483646

-2147483646L - 1L

## [1] -2147483647

-2147483646L - 2L

## Warning in -2147483646L - 2L: NAs produced by integer overflow

## [1] NA

-2147483646L

## [1] -2147483646

as.integer(0.5)

## [1] 0

as.integer(1.9)

## [1] 1

0xFACE

## [1] 64206

2^32

## [1] 4294967296

class(2^32)

## [1] "numeric"